



# outcome mapping

## Outcome Mapping on the Move: Using ICT to assess changes in behaviour towards ICT

### Summary

The spread of HIV&AIDS and malaria in Uganda is expedited by inadequate health information and ways of delivering critical health information more effectively between health workers in the field and health officers in central hubs. The Uganda Health Information Network project introduced the use of handheld computers, or PDAs, and wireless information communications systems to send and receive regular transmissions of information critical to community health. Improved information access, data collection and analysis among rural health workers supported timely decision making at different levels of the health system.

Outcome Mapping was used to track the uptake and effective use of these new communication technologies among health workers. But the PDAs also helped support Outcome Mapping. Just as they were crucial for inputting and sending health-related data, they were also used to experiment with and improve monitoring activities for the project. By uploading Outcome Mapping monitoring journals and related questionnaires on their PDAs, health workers were able to track their own and other boundary partners' changes in behaviour regarding these new communication technologies.

### Knowledge for Better Health: The Uganda Health Information Network

The Uganda Health Information Network (UHIN), operating from 2003 to the present in 5 districts of Uganda with level II, III and IV health centres, is jointly coordinated by the District Health Office, Makerere Faculty of Medicine, Uganda Chartered HealthNet, and SATELIFE: The Global Health Information Network, and was funded by IDRC. UHIN has provided a total of 590 handheld computers to frontline health workers in 174 health centers in Rakai, Lyantonde, Mbale, Manafwa, and Bududa districts, serving more than 1 million people.

#### Acronyms

ICT – Information  
Communication Technology  
DDHS – District Directors of  
Health Services  
HMIS – Health Information  
Management System  
MoH – Ministry of Health  
PDAs – Personal Digital  
Assistants  
UHIN – Uganda Health  
Information Network





The long-term vision of the UHIN project is to support the Ministry of Health of Uganda by contributing to the reduction of morbidity and mortality of the population from major causes of ill health. The project has focused its support by establishing an effective two-way electronic communication system for the delivery of timely, accurate, and relevant information, and developing data collection and transmission tools that contribute to the improvement of national healthcare standards. Driven by the belief that ICT can play an important role in improving healthcare by collecting information to support decision-making, improve medical databases, and engage in analysis of reliable data, as well as linking healthcare professionals for knowledge sharing, UHIN aims to improve the management of health information (including collection, storing, sharing, analyzing and retrieving) through low-cost and easy-to-use electronic systems.

PDAs have been the central piece to improve communication flow, which has meant introducing and guiding the use of these new systems with health workers so that they are able to use PDAs for routine reporting, accessing and downloading health-related information, organizing schedules and writing memos. Handheld computers have resulted in improved data quality and eliminated the potential for error during data entry, as compared to paper-based surveys and systems.

However, health workers didn't immediately know how, or were comfortable with the use of PDAs at the project's onset; thus, the use of PDAs became a central focus of the project, and the focus of behavioural change that the project aimed to contribute to in one of their key boundary partners.

## **OM's role in the project**

Suggested by IDRC, Outcome Mapping was used to fill a desire to place learning as a priority in project monitoring and evaluation; specifically, learning from the process of implementing an innovative way of capturing and transmitting data using technology in a low resourced environment.

Outcome Mapping was used in the UHIN project for project planning, using the Intentional Design, as well as for project monitoring, in the four different phases of the project. The pilot phase developed an Intentional Design, and subsequent phases have gone through an Intentional Design workshop to clarify the anticipated outcomes of the phase in question. While Boundary Partners modified only slightly (between the pilot and phase II) during these Intentional Design workshop, outcomes and progress markers were altered to reflect new intended behaviours. Table 1 provides a sample of the Intentional Design Framework for the UHIN project.



**Table 1: Intentional Design UHIN Pilot Phase**

**Vision** – Health and medical information is readily available to all healthcare providers in Uganda. Health providers, planners, policy makers and those responsible for allocating resources have the information that they need to make the best possible decisions in support of the health of the people of Uganda. Information and communications technology are key elements in the planning of government health programs and an activity that donors understand and provide support to enhance.

**Mission** – The project will transmit relevant health content to health workers based on their needs and collect quantitative and qualitative data to assess the impacts of interventions in improving clinical decision-making. We will facilitate the movement of data forms to electronic data collection methods to improve quality and reduce costs. We will assess scalability of the network and provide recommendations about the potential for further expansion of the project within Uganda

<b>Boundary partner 1:</b> Two District Directors of Health Services (DDHS) – Rakai and Mbale	<b>Summary of outcome challenge</b> <ul style="list-style-type: none"> <li>• Actively engaged in the process of sustaining handhelds in their districts</li> <li>• Communicating regularly with project team</li> <li>• Reducing amount of resources (travel, photocopying)</li> <li>• Upscaling (more PDAs and jacks)</li> <li>• Making more relevant and timely decisions based on timely transmittal of health data.</li> <li>• Dedicated to the use of handhelds themselves; setting example</li> </ul>
<b>Boundary partner 2:</b> PDA Users	<b>Summary of outcome challenge</b> <ul style="list-style-type: none"> <li>• Confident with the technology; not using paper-based forms</li> <li>• Uploading and downloading data to inform their work</li> <li>• Designing and conducting surveys</li> <li>• Communicating with experts re: medical information</li> <li>• Sharing information about the use of handhelds with their colleagues</li> </ul>
<b>Boundary partner 3:</b> Vendors	<b>Summary of outcome challenge</b> <ul style="list-style-type: none"> <li>• Provide services during the pilot phase (i.e. Wide Ray)</li> <li>• Working to improve the system and respond to needs and expectations about the new technology, the network, the reliability of the system (i.e. jacks)</li> <li>• Communicating with the PDA Users and DDHS to determine needs</li> </ul>
<b>Boundary partner 4:</b> ‘Palm Pioneers’ (health sectors and donor community)	<b>Summary of outcome challenge</b> <ul style="list-style-type: none"> <li>• Examining lessons learned and making recommendations</li> <li>• Expanding the network</li> <li>• Requesting and reviewing updates and providing comments</li> </ul>



Using OM, and based on a contextual analysis of the health system and environment, the UHIN defined these boundary partners for the important role they play in acting as gatekeepers for shifting current practices in the health system, and for contributing to behavioural changes, namely manifested as increased capacity in health workers and their interaction with health information.

A sample of progress markers for the PDA Users are outlined in Table 2; these point towards the capacity development of health workers in the use of PDAs to design, develop, deploy, and support advanced health information and communications. The needs of the health system demand improved communication, information access, data exchange and analysis for improved decision making, more rapid response to emerging situations and improved capacity of health workers, as they are able to access new knowledge.

**Table 2: Sample of Outcome Challenge and Progress Makers for PDA Users**

UHIN intends to see **PDA Users** in Mbale and Rakai districts confidently using their handhelds to support their health related activities. They have integrated their handhelds into their daily work lives and routinely use applications for storing contacts, using emails, arranging date books, etc. They are efficiently managing the information they receive and are seeking out new tools and resources for specific applications. They are collecting the required Health Information Management System (HMIS) (or other data) and entering it with ease into the handheld. They are transmitting the data in a timely manner to the relevant levels of feedback from DDHS. They are confident enough in the technology to have discarded the paper HMIS forms. With the time saved by up-loading and downloading data on the handheld they are conducting basic analysis of HMIS data which is informing their work. When appropriate they are designing and conducting new surveys to gather additional health information.

Via the handheld the PDA users are communicating with experts to receive and share information and ideas and are engaging in continuing medical education and testing. They are successfully searching for quality information relevant to their needs quickly, easily and at a reasonable cost. They are demonstrating their knowledge by presenting at grand rounds and other medical fora. They are championing the utility of handhelds within their districts and beyond supporting the efforts of other colleagues to adopt them in their work by sharing tips, programs, etc.

***Expect to See PDA Users***

- Asking for training to use PDAs
- Looking for places/ways to charge the PDAs
- Transmitting data using the network
- Showing off the PDA (bragging, walk with the “swagger”)
- Arguing over who uses their PDA the most

***Like to See PDA Users***

- Discovering new functions
- Accurately entering data in forms
- Spending less time entering and transmitting data
- Demanding more access to e-mail

***Love to See PDA Users***

- Looking for new ways to use the pda (new settings, new applications)
- Putting information to use in patient care
- Asking to create their own forms
- Demanding to be examined on the their new knowledge gained by using PDA
- Sharing their experiences with others who don't use PDAs



The strategies UHIN devised to support these changes included providing equipment, training in the use of PDAs, technical backing and support, connecting health workers to each other via PDAs to exchange information, connecting health workers with existing professional associations, and supporting PDA users to talk about their experience with other health workers not currently using PDAs.

## Innovations in monitoring: how did ICT help with OM data collection?

To track the acceptance and capacity of health workers regarding their PDAs, the project used **PDA User Surveys** as well as **focus group discussions and key informant interviews** in conjunction with the Outcome Journal. However, in addition, a particular highlight of this project was to use the actual PDAs to conduct the user surveys. Self-administered surveys (see Annex 1) were conducted using progress markers as questions for the PDA users to answer, on a monthly basis. In the early phases, these were completed by project staff. But as the boundary partners (PDA users) became more comfortable with the use of their PDAs, they began filling them out themselves on their PDAs (with technical assistance from the project if needed). These surveys are completed monthly. For each group of boundary partner, one individual (HMIS Officer for the PDA users and DDHS group, the M&E Officer at the project level and the systems administrator at the Ministry of Health) syncs the PDAs to a PC, which automatically analyses the data in its quantitative form and produces a report. The project M&E officer then gets the various reports and aggregates them into one report.

Reporting and reflection was then organized into “**have seen**” and “**yet to see**” in terms of the progress markers, and results were summarized in a ‘**progress marker status report**’ which was discussed with boundary partners in monthly briefing meetings. In these monthly meetings the boundary partners and the project team also described the next month’s activity plan. But to go more in depth, break out groups analyzed progress markers and proposed revisions, additions or modifications (including modifications to the actual phrasing of the progress marker to better reflect the desired behavioural change according to improved understanding of what that change needs to be, as well as re-assessing if a behaviour was an ‘expect to see’, ‘like to see’ or ‘love to see’). The discussions also led to project team operational decision-making and how they should adjust their strategy map for coming months (for example, by increasing capacity building, or providing more appropriate technological hardware for the PDAs to work).



An interviewer collecting data using a handheld for the NetMark Uganda Survey



By tracking the use of the PDAs, as well as the actual health data collected, the project was able to evidence:

- Improved data reporting in terms of timeliness and accuracy.
- Health workers comfort with the use of PDAs as a result of their demand for additional content and services.
- Decrease in costs of surveys and time to do data collection and analysis.
- Improved clinical care to patients with malaria, diarrhea and pneumonia as a result of receiving health information broadcast through the network and the ability of doctors to keep track of patients and treatments.
- Health workers referring to literature available in their handhelds, including national treatment guidelines, to inform their practice.
- Increased health worker and client satisfaction with services provided at rural health facilities.

Marie Stopes Uganda, one of the local boundary partner organizations, reported \$150 savings from photocopying questionnaires. In addition, PDA users brought in an average of ten more entries per day than paper questionnaires users.

#### How are PDAs useful for monitoring?

- Conducting surveys
- Submitting monitoring data within short time span
- Establishing two-way communication between HQ and field staff
- More routine data collection
- Keeping track
- More efficient reporting
- Storing data
- Doing math
- Writing text
- Can also track quantitative data
- Also, easy to learn and user-friendly

Health workers at remote sites, even those with no fixed telephone lines or regular supply of electricity, routinely access critical information like continuing medical education materials. Previously this information was unavailable to them. They no longer have to travel long distances to the district headquarters to deliver data or to receive feedback, conserving time and resources for the health system.

The parallels between collecting health related information on PDAs and collecting monitoring information using ICTs were not lost on the project, as in both instances similar characteristics were observed:

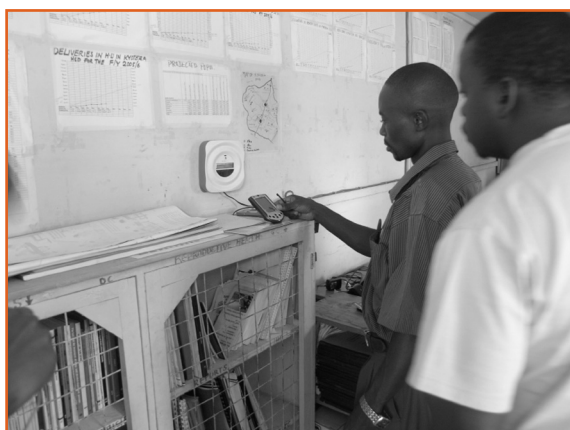
- **Reliability:** data collected using traditional paper-and-pencil methods is prone to transcription errors, loss, and damage and takes time to enter into databases, another process prone to human error.
- **Speed:** the labor-intensive nature of the data gathering process and the geographic and technological barriers to data movement within the system affects timely decision making on project.



- **Cost:** cost-effectiveness analysis showed that the network delivered a 24% savings per unit of spending over the traditional manual data collection and transmission approaches, a figure likely to increase as additional paper forms are converted.
- **Quality:** the districts reported benefits including improved data quality at point of collection, more timely access to data for analysis and decision-making, and more rapid response to emerging situations.
- A variety of mechanisms are employed for gathering information including collecting user information and demographics; tracking usage; tracking user comments and feedback; conducting stakeholder surveys; conducting user surveys; convening focus groups with participants; and convening stakeholder meetings.

Thus, improved information and data flow of health information set the stage for improved monitoring information and data flow.

However, the innovation of using PDAs for M&E was not without challenges, although these were viewed as common M&E challenges: Outcome Mapping itself was seen as a new, often jargon-filled methodology, and even more complicated for those boundary partners that had little previous exposure to any M&E at all – this required building their understanding and capacity of M&E. The participation of Boundary Partners from the Intentional Design phase helped greatly in creating a culture of evaluative thinking and practice. Motivating factors for understanding Outcome Mapping included the development of a shared vision that is motivating enough, but also fits into the daily activities of the boundary partners; the development of outcome challenges and progress markers by the boundary partners themselves; the different categories of progress markers (expect to see, like to see, love to see) to motivate boundary partners to aim for more challenging changes in their own behaviour; and the fact that boundary partners were now managing their own monitoring systems, instead of being “supervised” by superiors from headquarters.



Fred Tamale, the data manager at the Kalisizo Hospital, uploading data to the transmission device.



## Conclusions

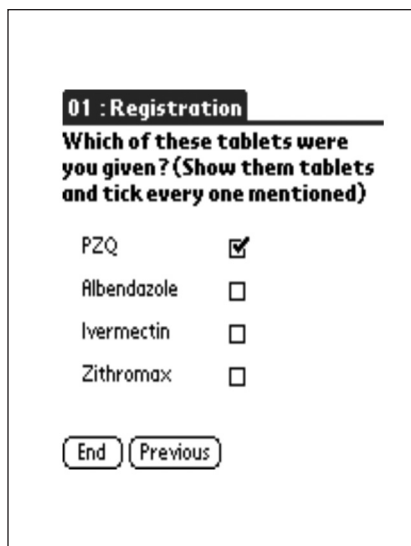
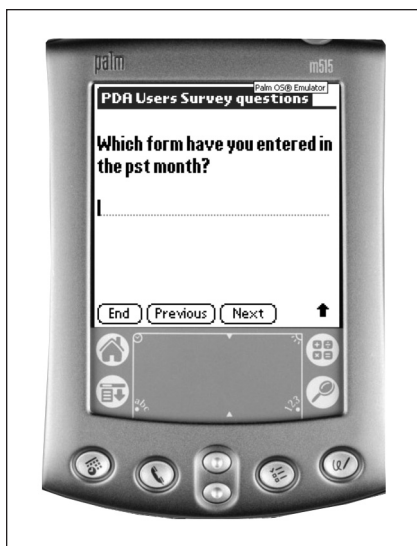
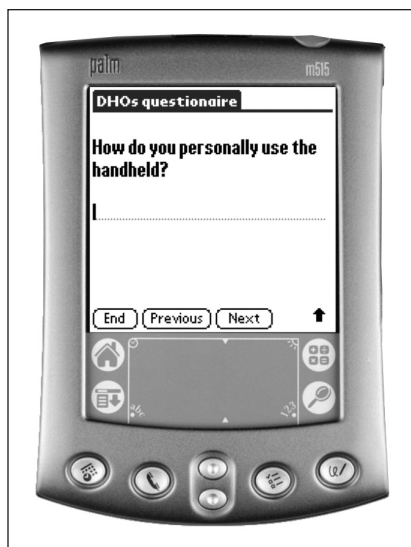
M&E is high on the list of priorities for development organizations in terms of making it more useful, effective, timely, rigorous and participatory in terms of sharing information. ICT in its different manifestations, such as PDAs, can potentially provide another way of collecting and storing data and making more frequent collection and uploading of that information in a timely manner increasingly possible. This gives more people access to better quality M&E information that they can use to make appropriate and timely decisions.

In addition to contributing to more effective decision-making within the health system, PDAs have potential for improving data collection for M&E and therefore opening doors to the possibility of more frequent data collection that has the potential to reach users at the right time. Just as PDAs can facilitate the sharing and accessing of critical medical and public health information, they can also be used as a management tool to track project outcomes.

*This case study was prepared by Patrick Kibaya, SATELLIFE and Kaia Ambrose, with editing contributions from Sarah Earl.*



## PDA Interfaces



### A sample of the screenshots for the OM M&E questionnaires.

There are many ways of answering questions – one can write in free text, or in other cases tick a box (see example below; this screenshot is for clinical data, but it gives an example of how the M&E data is collected as well). If a numerical answer is required, a numeric pad could be inserted to tick the number. The answers are stored on the PDA, but for data security, backup copies are made. The PDA is then "hotsync" with a PC or Laptop, and the data from the PDA then sits directly into an access database.



## Annex A: Sample PDA Progress Marker Survey

Expect to See PDA Users	Survey questions and response choices (response choices are in <i>italics</i> )
Asking for more training to use PDA	<ul style="list-style-type: none"> <li>Which applications on your handheld are you able to use comfortably? <i>Mobile forms, upload, wideray/browser, main applications</i></li> <li>In which areas would you need more training? <i>None, Charging, resetting, backup, beaming, editing forms, calibration</i></li> </ul>
Looking for places/ways to charge the PDAs	<ul style="list-style-type: none"> <li>How do you charge your PDA? <i>Car battery, solar panel, mains power</i></li> <li>Where do you charge your PDA? <i>At home, at work, else where</i></li> <li>How far do you have to travel to charge your PDA? <i>None, less than 5km, more than 5km</i></li> <li>Do you incur any cost to charge your PDA? <i>Yes, No</i></li> </ul>
Using PDAs for some purpose	<ul style="list-style-type: none"> <li>How often do you personally use your handheld? <i>{daily – 6, 2-3x/week – 4, weekly – 2, less than weekly – 1, never – 0}</i></li> <li>Do you use your handheld for completion of surveys? <i>{yes/no}</i></li> <li>Do you use your handheld for other activities? <i>{yes/no, give examples}</i></li> </ul>
Transmitting data effectively using the network	<ul style="list-style-type: none"> <li>How often do you use the upload application? <i>Never, daily, weekly, monthly</i></li> <li>How often do you get information from the network? <i>Never, daily, weekly, monthly</i></li> <li>Do you ever share by beaming information with fellow PDA users? <i>Yes, No</i></li> </ul>
Showing off the PDA (bragging, walk with the “swagger”)	<ul style="list-style-type: none"> <li>I show my PDA to most of my friends. <i>Strongly agree, agree, no opinion, disagree, strongly disagree</i></li> </ul>
Like to See PDA Users	Survey Questions and response choices
Discovering new functions	<ul style="list-style-type: none"> <li>Which functions of the PDA did you discover on your own? <i>Other than mobile forms, notepad, upload, graffiti, address book, beaming, browser/ Wide Ray</i></li> <li>What else do you use your PDA for other than HMIS forms and downloading content? <i>None, 1, 2 or more</i></li> </ul>
Accurately entering data in forms	<ul style="list-style-type: none"> <li>Are you familiar with the HMIS forms on PDA just as well as on paper?</li> <li>How much time does to complete HMIS 105 on your PDA?</li> <li>How many times to do you review your form before you upload on a jack? <i>None, once, twice, more than twice</i></li> </ul>
Fewer visits to the DDHS by PDA users	<ul style="list-style-type: none"> <li>How many visits to DDHS would you make monthly before the PDA project. <i>None, weekly, bi-weekly, more than 2 per month</i></li> <li>How many visits to DDHS would you make monthly before the PDA project. <i>None, weekly, bi-weekly, more than 2 per month</i></li> </ul>
Love to See PDA Users	Survey Questions and response choices
Sharing their experiences with others who have not (cross cutting all )	<ul style="list-style-type: none"> <li>How often do you share your experiences? <i>Daily, weekly, bi-weekly</i></li> <li>With whom do you share your experiences? <i>Family, friends, workmates</i></li> <li>Which ones are they? <i>Beaming, calibration, games</i></li> </ul>



Expect to see DDHS	Survey questions and response choices (response choices are in <i>italics</i> )
Using the PDA for multiple purposes, including surveys	<ul style="list-style-type: none"> <li>How often do you personally use your handheld? <i>{daily – 6, 2-3x/week – 4, weekly – 2, less than weekly – 1, never – 0}</i></li> <li>Do you use your handheld for completion of surveys? <i>{yes/no}</i></li> <li>Do you use your handheld for other activities? <i>{yes/no, give examples}</i></li> </ul>
Writing timely progress reports	<ul style="list-style-type: none"> <li>It is easier to write timely progress reports using the data collected by the handheld <i>{agreement matrix}{ 10 pts}</i></li> </ul>
Developing a local data base of the data received	<ul style="list-style-type: none"> <li>Do you retain the data received from the PDA project? <i>Yes, No</i></li> <li>If you keep it what do you use it for? <i>Just keep it, further analysis, share with others</i></li> </ul>
Provides feedback to lower levels in the district	<ul style="list-style-type: none"> <li>How often do you provide feedback to lower level units before/after PDA project? <i>weekly, monthly, quarterly</i></li> </ul>
Timely returns to the MOH	<ul style="list-style-type: none"> <li>What percentage of reports to the MOH was on time prior to receiving a handheld? <i>{number}</i></li> <li>What percentage of reports to the MOH is on time after receiving a handheld? <i>{number}</i></li> </ul>
Like to See DDHS	Survey questions and response choices
Saving money on printing & photocopying, time & resources compared to the paper system	<ul style="list-style-type: none"> <li>How much money did you spend each month on printing and photocopying prior to obtaining the handheld? <i>{number}</i></li> <li>How much money do you currently spend each month on printing and photocopying?</li> </ul>
Organizing more targeted interventions based on local needs	<ul style="list-style-type: none"> <li>Has the PDA data helped you identify local needs? <i>No, somewhat, yes</i></li> <li>The PDA project has helped me organize more targeted interventions based on local needs. <i>Strongly agree, agree, no opinion, disagree, strongly disagree</i></li> </ul>
Better relationships with resource center, NGOs, and HMIS officer	<ul style="list-style-type: none"> <li>Are you receiving timely data from the HMIS officer/NGOs? <i>Yes, somewhat, no</i></li> <li>Are you receiving complete data from the HMIS officer/NGOs? <i>Yes, somewhat, no</i></li> <li>Are you able to send timely and complete data to the resource centre? <i>Yes, somewhat, no</i></li> </ul>
Love to See DDHS	Survey questions and response choices
Creating new forms specific to your district	<ul style="list-style-type: none"> <li>Other than HMIS 105 and 033 how many other forms have you requested UHIN to put on PDA?</li> <li>Have you conducted any survey on PDA?</li> <li>Have you identified any forms or surveys you would want have on the PDAs?</li> </ul>
Increased ability to detect and respond to disease outbreaks	<ul style="list-style-type: none"> <li>Is data coming in earlier, same as before, later than before?</li> <li>Is the analysis easier, same, harder than before?</li> <li>Are able to detect and respond to disease outbreaks: <ul style="list-style-type: none"> <li>Slower than before</li> <li>Same as before</li> <li>More quickly than before</li> </ul> </li> </ul>



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